

TEMPERATURES OBTAINED BY KITES AT BERGEN POINT, N. J.

By HENRY L. ALLEN (dated April 14 and May 2, 1898).

Mr. Henry L. Allen, of Bayonne, N. J., communicates the following table of results of his observations of the temperature of the upper air taken by means of thermometers carried up by kites of the Eddy pattern.

This work has been done essentially by Mr. Allen, but occasionally assisted by Mr. William A. Eddy, Mr. W. W. Hotchkinn, and others, and by Mr. J. H. Eadie, local observer in the New Jersey State Weather Service, who contributed the average daily temperature at the surface of the ground given for comparison in the last three columns.

Simultaneous observations with kites at New York, N. Y., and Bayonne, N. J., were made on April 9, 1898.

For the sake of comparison the temperatures observed by Mr. Allen occasionally at the surface of the earth at Bayonne, at the beginning and end of the ascensions, have been given in columns 8 and 9. The Editor has also added, in columns 12, 13, 14, and 15, the temperatures at the beginning and ending, and the winds prevailing during the time of each ascension, as observed at the Weather Bureau station in New York City, where the Weather Bureau thermometer was 298 feet above ground and 314 above sea level, during this series of observations. This Weather Bureau station is 11 miles northeast of Bayonne, the greater part of the intervening region is occupied by New York harbor. Mr. Allen says:

In November, 1896, I purchased a Six's registering thermometer, with a 10-inch wood back. Those incased in tin were not desirable on account of weight. The brown pasteboard box, which came with it, was turned into a protector for the thermometer during its aerial trips, by cutting windows, folding inward, in three sides of the box, to secure a circulation of air, and still shade it from the sun. But only a few of the ascensions have been taken when the sun was shining, and some at night with the thermometer exposed.

For an ascension the thermometer was tied into the box, temperature and time noted, and then a sling of two loops of string fastened around the closed box, with two rubber bands around all for safety. This sling holding the thermometer box was then fastened into the kite line

about 100 feet below the kite, then the time of its leaving the ground noted and line paid out, carrying up the thermometer to the required altitude. My thermometer is *not* fastened to the kite. My reason for this is that if the thermometer was fastened to the kite, the record might be destroyed by a quick dive made by the kite in very strong winds; suspending the thermometer below the kites insures safety from that source, as the line would gently sway from side to side, carrying the thermometer with it, and not exposing it to the destroying influence of the dive.

When the ascensions have been made at night, I have usually had on the line a light to which the altitude is triangulated, otherwise the triangulation is made to the kite, and the distance between the kite and thermometer subtracted from that altitude. Lanterns have never been put near enough to the thermometers to spoil the record.

The maximum temperature is usually that at the ground, but sometimes as the thermometer ascends it has passed through a warm stratum sending the mercury up from 1° to 3°, and then falling to the minimum at the highest point. Ascension No. 13 is the only exception. Then the maximum was at the highest elevation, and the minimum at the earth.

In regard to the average temperatures noted by me on the three days given in the table, I wish to state that my thermometer was placed on the western side of the house, between the blinds and window glass, and in the afternoon it received the radiated heat of the sun, and, therefore, I use Mr. Eadie's. The trouble was not with my thermometer but its position. But beginning with April 1, 1898, my thermometer was placed in a shelter on the north side of the house, and the instruments hung about 1 foot from the wall of the house. In the record of the ascension of April 9, 1898, you will notice that my averages compare better.

Up to May 1, 1898, all of my temperature records have been taken with the same Six's thermometer that was used in the ascensions. But hereafter my record for the shelter will be taken from a fine glass Six's thermometer, which has been carefully tested and regulated by the maker.

I can not explain why the maximum and minimum temperatures of the kite record are the same as those at the earth, further than saying that the temperature was falling equally from the surface of the earth to about 400 feet above the earth on those occasions.

My records are taken between Fourth and Fifth streets, while Mr. Eadie's are taken at Thirty-sixth street, this section of the city being known as Bergen Point. The distance between my kite field and Mr. Eadie's house is about 2.25 miles.

Ascensions Nos. 12, 13, 14, and 15 were made by Mr. Eddy for me, with his and Mr. Hotchkinn's thermometers, but I assisted during the ascension.

Record of thermometer ascensions made at Bergen Point, Bayonne, N. J., by Henry L. Allen.

| Number. | Ascension. | | | | Kite record. | | | | Local conditions. | | | | New York. | | | | Average daily temperature observed by Mr. Eadie. | | |
|---------|---------------------|---------------|---------------|--------------------|--------------|-----------------|--------------|----------|-------------------|------|-------------------|----------|--------------------------|------------|-----------|----------|--|-------|--|
| | Date. | P. M. | | Altitude. | Temperature. | | Temperature. | | Wind. | Sky. | Temperature. | | Winds during ascensions. | | Same day. | 2d day. | 3d day. | | |
| | | Began. | Ended. | | Max. | Min. | Begin-ning. | End-ing. | | | Begin-ning. | End-ing. | Direc-tion. | Velo-city. | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | | |
| | | <i>II. M.</i> | <i>II. M.</i> | <i>Feet.</i> | <i>°</i> | <i>°</i> | <i>°</i> | <i>°</i> | | | <i>°</i> | <i>°</i> | | | <i>°</i> | <i>°</i> | <i>°</i> | | |
| 1 | November 24, 1896. | 9 00 | 9 45 | 375 | 64 | 50 | ..... | ..... | w. | 4 | Clear. | 54 | 53 | nw | 12 | 52.5 | 44 | 51 | |
| 2 | December 10, 1896. | 8 00 | 9 00 | 400 | 54 | 44 | ..... | ..... | s. | 4 | Clear-cloudy. | 47 | 47 | s. | 4 | 47.5 | 41.5 | 39.5 | |
| 3 | December 25, 1896. | 4 45 | 5 15 | 500 | 38 | 26 | ..... | ..... | s. | 4 | Clear.* | 28 | 27 | sw. | 15 | 22.5 | 25.5 | 21.5 | |
| 4 | January 30, 1897. | 4 45 | 5 15 | 825 | 40 | 27 | ..... | ..... | w. | 4 | Clear.* | 29 | 29 | nw. | 12 | 26 | 23.5 | 21.5 | |
| 5 | March 8, 1897. | 8 55 | 9 25 | 300 | 41 | 34 | ..... | ..... | e. | 2 | Clear. | 33 | 32 | e. | 6 | 30.5 | 39 | 49 | |
| 6 | April 10, 1897. | 4 10 | 4 30 | 200-300 | 57 | 52 | ..... | ..... | w. | 4 | Clear. | 51 | 50 | nw. | 19 | 49.5 | 48.5 | 46 | |
| 7 | June 16, 1897. | 7 25 | 7 55 | 600 | 70.5 | 70 | ..... | ..... | w. | 3 | Clear. | 75 | 74 | nw. | 16 | 70.5 | 63 | 70.5 | |
| 8 | August 10, 1897. | 8 15 | 10 15 | 925 | 72 | 67 | ..... | ..... | se. | 3 | Cloudy. | 70 | 69 | se. | 12 | 72 | 75.5 | 74 | |
| 9 | September 4, 1897. | 8 45 | 10 10 | 700-800 | 65 | 60 | ..... | ..... | s. | 3-1 | Clear. | 65 | 65 | nne. | 10 | 66 | 71 | 77 | |
| 10 | September 17, 1897. | 1 30 | 1 45 | 300 | 79.5 | 76 | ..... | ..... | nw. | 5 | Clear-pt. cloudy. | 77 | 77 | nw. | 25 | 74 | 60 | 63.5 | |
| 11 | September 25, 1897. | 8 30 | 12 00 | 1,510 | 66 | 58 | ..... | ..... | sw. | 2 | Clear. | 67 | 62 | ssw. | 9 | 68.5 | 69 | 63.5 | |
| 12 | October 9, 1897. | 8 30 | 10 30 | 600 | 50 | 46 | ..... | ..... | n. | 4 | Clear. | 49 | 46 | nw. | 18 | 60.5 | 49 | 58.5 | |
| 13 | October 16, 1897. | 8 44 | 10 10 | 436 | 74 | 70 | 70 | ..... | sw. to w. | 5 | Clear. | 75 | 73 | sw. | 26 | 76.5 | 63 | 48 | |
| 14 | October 23, 1897 +. | 7 00 | 10 40 | 1,810 ³ | 51 | 50 ⁴ | ..... | ..... | e. | 3 | Cloudy. | 51 | 50 | e. | 9 | 52.5 | 47 | 53 | |
| 15 | October 30, 1897 +. | 7 20 | 8 15 | 270 ⁵ | 43 | 39 ⁶ | 40 | ..... | n. | 4 | Clear. | 42 | 42 | nw. | 15 | 46 | 44.5 | 54 | |
| 16 | January 27, 1898. | 7 40 | 8 20 | 350-400 | 40 | 28 | 38 | ..... | wnw. | 2 | Cloudy. | 39 | 31 | nw. | 8 | 30.5 | 25 | 22 | |
| 17 | February 7, 1898. | 7 30 | 8 05 | 300 | 39 | 36 | ..... | ..... | ssw. | 2 | Cloudy-clear. | 39 | 39 | se. | 6 | 34 | 32 | 34 | |
| 18 | February 12, 1898. | 8 50 | 9 25 | 300 | 44 | 42 | 44 | ..... | nw. | 3 | Clear-pt. cloudy. | 46 | 45 | nw. | 10 | 45 | 43.5 | 37 | |
| 19 | March 12, 1898. | 8 20 | 9 35 | 220 | 62 | 58 | 62 | 58 | s. | 4 | Cloudy. | 53 | 55 | s. | 18 | 55.5 | 57 | 51 | |
| 20 | March 19, 1898. | 4 45 | 5 35 | 390 | 72 | 67 | 72 | 67 | s. | 4 | Partly cloudy. | 69 | 68 | sw. | 16 | 59 | 63 | 43 | |
| 21 | April 9, 1898. | 4 40 | 5 40 | 400 | 51 | 45 | 51 | 47 | s. | 3 | Cloudy. | 47 | 47 | ..... | 12 | 44.5 | 51 | 49.5 | |
| 22 | April 9, 1898 ‡. | 5 25 | 5 45 | 680 | 49 | 45 | 49 | 47 | sse. | 3 | Cloudy. | ..... | ..... | ..... | ..... | ..... | ..... | ..... |  |
| 23 | April 23, 1898. | 4 40 | 5 45 | 400 | 67 | 62 | 66 | 61 | sse. | .. | Partly cloudy. | 63 | 61 | se. | 9 | 62 | 60 | 51.5 | |
| 24 | April 30, 1898. | 9 15 | 10 00 | 370 | 59 | 56 | 56 | 57 | wnw. | .. | Clear to cloudy. | 62 | 60 | nw. | 8 | ..... | ..... | ..... |  |

*Snow on ground. †Two thermometers sent up on line. ‡Ascension at the Postal Telegraph Building, New York City, by William A. Eddy and W. W. Hotchkinn.